

April 2011

Curriculum Vitae

**Arthur L. Shaffer III**

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**EDUCATION**

**Ph.D. Molecular Biology and Genetics-Immunology**

1991-1996

Graduate Program in Immunology

Johns Hopkins University School of Medicine

Baltimore, MD

**B.A. Biology            1985-1989**

Department of Biology/ University Honors Program

University of Delaware

Newark, DE

**PROFESSIONAL/ RESEARCH EXPERIENCE**

**Staff Scientist 2001-present**

National Cancer Institute, National Institutes of Health

Bethesda, MD

Research Focus: Genomic analysis of normal

immune system development and lymphomagenesis.  
Principal Investigator: Louis M. Staudt, M.D., Ph.D.

## **Post-Doctoral Fellow**

1996-2001

National Cancer Institute, National Institutes of Health  
Bethesda, MD

**Research Focus:** Molecular analysis of the regulation and targets of BCL-6, a transcriptional repressor that causes human lymphoma.

Principal Investigator: Louis M. Staudt, M.D., Ph.D.

## **Candidate, Doctor of Philosophy**

1991-1996

Graduate Program in Immunology  
Johns Hopkins University School of Medicine  
Baltimore, MD.

# Thesis: The Role of the pre-B Cell Receptor in B Cell Development.

Advisor: Mark Schlissel, M.D., Ph.D.

Scientist Land II, GEO-CENTERS, INC.

1989-1991

# Naval Medical Research Institute and Georgetown University

National Bone Marrow Registry, Washington, DC.

## Project: Developing Molecular Techniques for HLA-typing.

Administrators: Carolyn Hurley, Ph.D. (Georgetown)  
Robert J. Hartzman, Capt., USN (NMP)

## **Cooperative Work-Study Program**

1987-1989

DuPont Experimental Station, Basic Research Dept.  
Wilmington, DE

# Project: Molecular Basis of Retroviral Restriction in Embryonic Stem Cells

Advisor: Richard Scott, Ph.D.

**Undergraduate Research Program**      1986-1989

University Honor Program/ University of Delaware  
Newark, DE

Project: Developmental Mutants of *Polysphondylium pallidum*.

Advisor: David Francis, Ph.D

## **WORK-RELATED ACTIVITIES AND OFFICIAL DUTIES**

### **Coordinated Staudt Lab Renovation and Move**

2008-2009

Oversaw the progress of renovations and coordinated with lab members, contractors and movers to unite the Staudt Lab's 3 separate spaces into one lab.

Bethesda, MD

### **NIH Immunology Interest Group (IIG) Steering Committee:**

**Staff Scientist Representative** 2004-2006, 2008-

2010

National Institutes of Health, Immunology Interest Group (IIG), Steering Committee,

Bethesda, MD

Participated in the organization of a weekly NIH-wide Immunology seminar series as well as the annual NIH Immunology retreat, serving the 1500 members of the IIG.

### **Lecturer, Clinical Allergy Training Program, NIAID**

2005, 2007-2010

NIH, Bethesda MD

Taught the B cell Development & Malignancies Lecture

### **Instructor, FAES Immunology Course (IMMU504/ IMMU521)**

2003, 2005-2010

NIH, Bethesda MD

Taught the B cell Development Lecture,  
developed handouts and test questions

### **Program Review, Ad Hoc Committee Member**

Reviewing the Office of Biotechnology Products,  
OPS, CDER, FDA  
Bethesda, MD  
October 2007

**Co-editor Immunological Reviews:  
Genomics and Proteomics Issue**

with Dr. Louis M. Staudt  
Volume 210, April 2006

**Co-organizer B Cell Workshop**

2000-2006

National Cancer Institute, National Institutes of Health  
Bethesda, MD  
Recruit speakers and organize a weekly meeting of intra-  
and extra-mural scientists interested in B cell biology



## **INVITATIONS AND MEETING PARTICIPATION**

**April 16 2011**

**Keystone Symposium, B Cells: New Insights into Normal versus Dysregulated Function**

**Whistler, BC Canada**

Workshop Co-chair- “B Cell Lymphoma and Leukemia”

Invited Speaker- “The IRF4-SPIB interface as a Therapeutic Target in DLBCL”

**March 28 2011**

**Metabolism Branch Seminar**

**Bethesda, MD**

“IRF4: and Achilles’ Heel of ABC-DLBCL”

**September 21 2010**

**NIH Immunology Interest Group Retreat**

**Cambridge, Maryland**

Invited Speaker

“Combining Network Theory and perturbation-based gene expression profiling in a cell line model to discover new therapeutic targets in B cell lymphoma”

**April 15 2010,**

**Laboratory of Cellular and Molecular Biology**

**National Institute on Aging, NIH**

**Baltimore, Maryland**

Invited Speaker

“Bad B Cells: Transcription Factor Addiction in Aggressive Lymphoma”

**July 9 2009,**

**FASEB 2095 Summer Conference,  
Carefree, Arizona**

Lymphocytes Development and Differentiation: From Stem Cells to Effector Cells

Invited Workshop Speaker, “IRF4 Addiction in B cell Malignancy”

**May 5 2009**

**Demystifying Medicine Course, NIH, Bethesda MD**

Speaker: Multiple Myeloma: Diagnosis and Treatment in the Genomic Era

**April 21 2009,**

**American Association of Cancer Researchers (AACR)  
Denver, CO**

Invited Speaker, Session: New Biological Insights are Changing the Way We Treat Myeloma.

“IRF4 and non-oncogene addictions in cancer: Myeloma as a model”

**December 3 2008,**

**George Washington University,  
Washington, DC**

Invited Lecturer, “Cancer Genomics: New Approaches to the Discovery of Novel Therapies.”

**October 24 2008**

**FDA, Division of Therapeutic Proteins Seminar Series**

Invited Seminar Speaker, “IRF4: A genomic-scale screen finds a new molecular targets in lymphoma and myeloma”

**October 1-3 2008**

**NIH Immunology Retreat  
Gettysburg, PA**

Invited Seminar Speaker, “The role of IRF4 in B cell

malignancy”

**May 2008**

**National Institutes of Health**

**Bethesda, MD**

Invited Speaker, Immunology Interest Group Seminar  
“Addiction to an Aberrant Network: IRF4 in Multiple  
Myeloma”

**November 2007,**

**George Washington University,**

**Washington, DC**

Invited Lecturer, “Achilles' Heel shRNA screens---a tool for  
understanding and treating tumors”

**February 2007,**

**Keystone Symposium on Biology of B Cells in Health and  
Disease**

Invited Workshop Speaker, Transcription Factors in B Cell  
Development and Differentiation

“An shRNA ‘Achilles’ heel’ Screen Reveals the  
Requirement for IRF4 Expression in Plasma Cells and  
Multiple Myeloma”

Fairmont Banff Springs, Alberta, Canada

**January 2007,**

**NIH Cancer Immunology and Hematology Extramural Program**

Invited Speaker

“Cancer Genomics and B cell Lymphoma”

**November 2006,**

**George Washington University,**

**Washington, DC**

Invited Lecturer, “Cancer genomics: B cell  
Lymphoma”

**October 2006,**

**NIH Immunology Retreat**

**Airlie House, VA**

Invited Seminar Speaker, “An Achilles’ heel shRNA screen reveals the requirement for IRF4 in multiple myeloma”

**November 2005,**

**George Washington University,**

**Washington, DC**

Invited Lecturer, “Cancer genomics: B cell Lymphoma”

**October 2005,**

**Johns Hopkins University Immunology Retreat,**

**Baltimore, MD**

Invited Plenary Speaker, “B Cell Gene Expression: Reduce, Rebuild, Reveal”

**July 2005,**

**FASEB 2005 Summer Conference,**

**Tucson, Arizona**

Lymphocytes and the Immune System: Molecular, Cellular and Integrative Mechanisms

Invited Workshop Speaker, “Understanding B Cell Differentiation through Single-Factor Gene Expression Analysis”

**February 2005,**

**Columbia University**

**New York, NY**

Invited Seminar Speaker, “Dissecting B cell Differentiation and Disease Using Gene Expression Profiles”

**October 2004,**

**NIH Immunology Retreat**

**Airlie House, VA**

Invited Seminar Speaker, “XBP-1 controls the professional secretory cell program in plasma cells”

**January 2003**

**Keystone Meeting**

**B Cells and Antibodies: Laboratory to Clinic**

**Snowbird, UT**

Participant and Poster Presenter. “The role of XBP-1 in plasma cells revealed by gene expression profiling”

**May 2002**

**EMBO Meeting: Lymphocyte Receptors and Signaling**

**Sienna, Italy**

Invited Participant, “Follow the Red and Green Spots: Chips and Pathways”

**February 2002**

**Indiana University Medical School**

**Indianapolis, IN**

Invited Speaker, “Signatures of the Immune Response”

**November 2001**

**American Society for Tropical Medicine and Hygiene**

**Annual Meeting**

**Atlanta, GA**

Invited Speaker, “A Genome-wide view of Immune Responses”



## **PUBLICATIONS**

Vu N. Ngo<sup>1</sup>, Ryan M. Young, Roland Schmitz, Sameer Jhavar, Wenming Xiao, Kian-Huat Lim, Holger Kohlhammer, Weihong Xu, Yandan Yang, Hong Zhao, **Arthur L. Shaffer**, Paul Romesser, George Wright, John Powell, Andreas Rosenwald, Hans Konrad Muller-Hermelink, German Ott, Randy D. Gascoyne, Joseph M. Connors, Lisa M. Rimsza, Elias Campo, Elaine S. Jaffe, Jan Delabie, Erlend B. Smeland, Richard I. Fisher, Rita M. Braziel, Raymond R. Tubbs, J. R. Cook, Dennis D. Weisenburger, Wing C. Chan & Louis M. Staudt (2010) Oncogenically active MYD88 mutations in human lymphoma. *Nature*. 470(7332):115-9.

Annnunziata CM, Davis RE, Hernandez L, Zingone A, Lamy L, Lam LT, Hurt EM, **Shaffer AL**, Kuehl WM, Staudt LM. (2010) A mechanistic rationale for MEK inhibitor therapy in myeloma based on blockade of MAF oncogene expression. *Blood*. 117(8):2396-404.

Lixin Rui, N.C. Tolga Emre, Michael J. Kruhlak, Hye-Jung Chung, Christian Steidl, Graham Slack, George W. Wright, Georg Lenz, Vu N. Ngo, **Arthur L. Shaffer**, Weihong Xu, Hong Zhao, Yandan Yang, Laurence Lamy, R. Eric Davis, Wenming Xiao, John Powell, David Maloney, Craig J. Thomas, Peter Möller, Andreas Rosenwald, German Ott, Hans Konrad Muller-Hermelink, Kerry Savage, Joseph M. Connors, Lisa M. Rimsza, Elias Campo, Elaine S. Jaffe, Jan Delabie, Erlend B. Smeland, Dennis D. Weisenburger, Wing C. Chan, Randy D. Gascoyne, David Levens, Louis M. Staudt. (2010) Cooperative Epigenetic Modulation by Cancer Amplicon Genes. *Cancer Cell*, 18(6): 590-605.

Pérez-Galán P, Mora-Jensen H, Weniger MA, **Shaffer AL 3rd**, Rizzatti EG, Chapman CM, Mo CC, Stennett LS, Rader C, Liu P, Raghavachari N, Stetler-Stevenson M, Yuan C, Pittaluga S, Maric I, Dunleavy KM, Wilson WH, Staudt LM, Wiestner A. (2010) Bortezomib resistance in mantle cell lymphoma is associated with plasmacytic differentiation. *Blood*, 117: 542-552.

R. Eric Davis, Vu N. Ngo, Georg Lenz, Pavel Tolar, Ryan Young, Paul B. Romesser<sup>1</sup>, Holger Kohlhammer, Laurence Lamy, Hong Zhao, Yandan Yang, Weihong Xu, **Arthur L. Shaffer**, George Wright, Wenming Xiao, John Powell, Jian-kang Jiang, Craig J. Thomas, Andreas Rosenwald, German Ott, Hans Konrad Muller-Hermelink, Randy D. Gascoyne, Joseph M. Connors, Lisa M. Rimsza, Elias Campo, Elaine S. Jaffe, Jan Delabie, Erlend B. Smeland, Richard I. Fisher, Rita M. Braziel, Raymond R. Tubbs, J. R. Cook, Denny D. Weisenburger, Wing C. Chan, Susan K. Pierce and Louis M. Staudt (2010)  
Chronic Active B Cell Receptor Signaling in Diffuse Large B Cell Lymphoma  
*Nature*, 463:88-92.

**Shaffer AL**, Emre NC, Romesser PB, Staudt LM (2009)  
IRF4: Immunity. Malignancy! Therapy? *Clin Cancer Res*.  
9 May 1;15(9):2954-61

Lenz G, Wright GW, Emre NC, Kohlhammer H, Dave SS, Davis RE, Carty S, Lam LT, **Shaffer AL**, Xiao W, Powell J, Rosenwald A, Ott G, Muller-Hermelink HK, Gascoyne RD, Connors JM, Campo E, Jaffe ES, Delabie J, Smeland EB, Rimsza LM, Fisher RI, Weisenburger DD, Chan WC, Staudt LM (2008)  
Molecular subtypes of diffuse large B-cell lymphoma arise by distinct genetic pathways. *Proc Natl Acad Sci USA* Sep 9;105(36):13520-5.

**Arthur L. Shaffer**, N.C. Tolga Emre, Laurence Lamy, Vu N. Ngo, George Wright Wenming Xiao, John Powell, Sandeep Dave, Xin Yu, Hong Zhao, Yuxin Zeng, Bangzheng Chen, Joshua Epstein and Louis M. Staudt (2008) IRF4 Addiction in Multiple Myeloma. *Nature* 454:226-231.

Tracy C. Kuo, **Arthur L. Shaffer**, Joseph Haddad, Jr., Yong Sung Choi, Louis M. Staudt, and Kathryn Calame (2007) Repression of BCL-6 is required for the formation of human memory B cells in vitro. *J. Exp. Med* 16;204(4):819-30.

R Sciammas\*, **Shaffer AL\***, Schatz JH, Zhao H, Staudt LM, Singh H. (2006) Graded expression of interferon regulatory factor-4 coordinates isotype switching with plasma cell differentiation. *Immunity*. 25(2): 225-36.  
\*equal coauthors

Han SS, Peng L, Chung ST, Dubois W, Maeng SH, **Shaffer AL**, Sporn MB, Janz S., (2006) CDDO-Imidazolidine inhibits growth and survival of c-Myc-induced mouse B cell and plasma cell neoplasms. *Molecular Cancer*, 7:22

Liu, H. , G.C. Ippolito , J. K Wall , T. Niu , L. Probst , B-S. Lee , K. Pulford , A. Banham , L. Stockwin , **A.L. Shaffer** , L. M Staudt , C. Das , M. J. Dyer and P. W. Tucker, (2006) Functional studies of BCL11A: Characterization of the conserved BCL11A-XL splice variant and its interaction with BCL6 in nuclear paraspeckles of germinal center B cells *Molecular Cancer*, 5:18

**Shaffer, A.L.**, G. Wright, L. Yang, J. Powell, V. Ngo, L. Lamy, L. Lam, R.E. Davis, L. M. Staudt, A library of gene expression signatures to illuminate normal and pathological lymphoid biology. (2006) *Immunological Reviews* 210, 67-87.

Spence, S.L. , **Arthur L Shaffer**, Louis M. Staudt, Sewit Amde, Sutana Manney, Cheryl Terry, Keith Weisz, Peter Nissley. (2006) Transformation of Late Passage Insulin-like Growth Factor-I Receptor Null Mouse Embryo Fibroblasts by Simian Virus 40 T Antigen. *Cancer Res*, 66, 4233-4239.

Seong-Su Han, **Arthur L Shaffer**, Liangping Peng, Seung-Tae Chung, Jae-Hwan Lim, Sungho Maeng, Joong Su Kim, Nicole McNeil, Thomas Ried, Louis M Staudt and Siegfried Janz (2005) Molecular and cytological features of the mouse B-cell lymphoma line iMycEm-1. (2005) *Molecular Cancer* Nov 9;4(1):40.

Sung Sup Park\*, **Arthur L. Shaffer\***, Joong Su Kim\*, Wendy duBois , Michael Potter, Louis M. Staudt and Siegfried Janz. (2005) Insertion of *Myc* into *Igh* accelerates peritoneal plasmacytomas in mice. *Cancer Res* 65 (17), p7644-7652.  
\*equal coauthors

**Shaffer, A.L.**, Miriam Shapiro-Shelef, Neal N. Iwakoshi, Ann-Hwee Lee, Shu-Bing Qian , Hong Zhao, Xin Yu, Liming Yang, Bruce K. Tan, Andreas Rosenwald, Elaine M. Hurt, Emmanuel Petroulakis, Nahum Sonenberg, Jonathan W. Yewdell , Kathryn Calame, Laurie H. Glimcher, and Louis M. Staudt (2004) XBP1, downstream of Blimp-1, expands the secretory apparatus and other organelles, and increase protein synthesis in plasma cell differentiation. *Immunity* 21, 81-93.

Chainarong Tunyaplin, **A. L. Shaffer**, Cristina D. Angelin-Duclos, Xin Yu, Louis M. Staudt, and Kathryn L. Calame (2004) Direct Repression of *prdm1* by Bcl-6 Inhibits Plasmacytic Differentiation. *J. Immunol* 173 (2), 1158-65.

Hurt, E.M., Adrian Wiestner, Andreas Rosenwald, **A.L. Shaffer**, Elias Campo, Tom Grogan, P. Leif Bergsagel, W. Michael Kuehl, and Louis M. Staudt. (2004) Overexpression of c-maf is a frequent oncogenic event in multiple myeloma that promotes proliferation and pathological interactions with bone marrow. *Cancer Cell* 5, 191-199.

**Shaffer, A.L.**, Rosenwald, A., and Staudt, L.M. (2002) Lymphoid Malignancies: the dark side of B cell differentiation. *Nature Reviews in Immunology* 2, 920-932.

**Shaffer,A.L.**, Kuo-I Lin, Tracy C. Kuo, Xin Yu, Elaine M. Hurt, Andreas Rosenwald, Jena M. Giltnane, Liming Yang, Hong Zhao, Kathryn Calame, Louis M. Staudt (2002) Blimp-1 orchestrates plasma cell differentiation by extinguishing the mature B cell gene expression program. *Immunity* 17, 51-62.

**Shaffer, A.L.**, Rosenwald, A., Hurt, E.M., Giltnane, J.M., Lam L.T., Pickeral, O.K. and Staudt, L.M. (2001) Signatures of the Immune Response. *Immunity* 15, 375-385.

**Shaffer, A.L.**, Yu, X, He, Y.S., Chan, E.P. and Staudt L.M. (2000) BCL-6 Represses Genes That Function in Lymphocyte Differentiation, Inflammation and Cell Cycle Control. *Immunity* 13, 1-20.

Staudt, L.M., Dent A.L., **Shaffer A.L.**, Yu, X. (1999) Regulation of cell fate decisions and lymphomagenesis by BCL-6. *International Review of Immunology* 18, 381-403.

**Shaffer, A.L.** and Schlissel, M.S. (1997) A Truncated Heavy Chain Protein Relieves the Requirement for Surrogate Light Chains in Early B Cell Development.. *Journal of Immunology* 159, 1265-1275.

Dent, A.L., **Shaffer. A.L.**, Yu, X. Allman, D., and Staudt, L.M. (1997) Control of inflammation, cytokine expression, and germinal center formation by BCL-6. *Science* 276, 589- 592.

**Shaffer, A.L.**, Peng, A, and Schlissel, M.S. (1997) In vivo occupancy of the kappa light chain enhancers in primary pro- and pre-B cells: a model for kappa locus activation. *Immunity* 6, 131-143

Stanhope-Baker, P., Hudson, K., **Shaffer, A.L.**, Constantinescu, A., Schlissel, M.S. (1996) Cell Type-Specific Chromatin Structure Determines the Targeting of V(D)J Recombinase Activity In Vitro. *Cell* 85, 887-897.

Krop, I., **Shaffer, A.L.**, Fearon, D.T., Schlissel, M.S. (1996)  
The Signaling Activity of Murine CD19 is Regulated During B Cell  
Development. *Journal of Immunology* 157, 48-56.

**Shaffer, A.L.**, Falk-Wade, J.A., Tortorelli, V., Cigan, A., Carter, C.,  
Hassan, K., Hurley, C.K. (1992) HLA-DRw52-associated DRB1 alleles:  
Identification using polymerase chain reaction amplified DNA, sequence specific  
oligonucleotide probes, and a chemiluminescent detection system. *Tissue  
Antigens* 39, 84-90.

Francis, D., **Shaffer A.**, and Smoyer, K. (1991) Three genes which  
affect founding of aggregation in *Polysphondylium pallidum*. *Genetics* 128,  
563-569.

**Shaffer, A.L.**, Wojnar, W., Nelson, W. (1990) Amplification, Detection and Automated Sequencing of Gibbon Interleukin-2 mRNA by *Thermus Aquaticus* DNA Polymerase Reverse Transcription and Polymerase Chain Reaction. *Analytical Biochemistry* 190, 292-296.

Francis, D. and **Shaffer, A.** (1988) A Mutant Strain of *Polysphondylium* with Defects in Many Genes. *Developmental Genetics* 9: 629-638.

## **PAST and CURRENT(\*) COLLABORATIONS**

Dr. Siegfried Janz, NCI, Gene expression analysis of mouse models of human myc-driven lymphomas.

Dr. Michael Potter, NCI, Gene expression analysis of plasma cell differentiation and plasmacytomagenesis

Dr. Kathryn Calame, Columbia University, The differentiation program of normal human GC B cells to memory or plasma cells

Dr. Laurie Glimcher, Harvard University, The role of transcription factor XBP-1 in plasma cell differentiation

Dr. John Monroe, University of Pennsylvania, Analysis of the development and gene expression program of transitional B cells

Dr. Harinder Singh, University of Chicago, The role of IRF4 in mature B cell differentiation

Dr. Phil Tucker, University of Texas at Austin, BCL11 isoform expression in B cell differentiation and malignancy

\*Dr. Mike Teitel, UCLA, Effects of manipulating transcription factors on malignant cell mass/content

\*Dr. Edward Ott, Dr. Michelle Girvan, Dr. Wolfgang Lossert, University of Maryland, Using network theory to elucidate the transcriptional network of malignant cells

\*Dr. Adrian Weistner, NHLBI, NIH, Studying the contribution of B cell differentiation to chemotherapy resistance in cancer.

